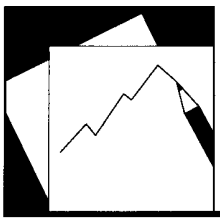
WP/14/59



IMF Working Paper

Fiscal Policy in Latin America over the Cycle

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INTERNATIONAL MONETARY FUND

 WP/14/59

IMF Working Paper

Western Hemisphere Department

Fiscal Policy in Latin America over the Cycle

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Authorized for distribution by Dora Iakova

April 2014

Abstract

This paper provides an analysis of the cyclical stance of fiscal policy in Latin America. Its contributions include developing a new measure of the cyclicality of fiscal policy, careful analysis of the statistical significance of results, and accounting for the effect of commodity prices on fiscal balances. The new cyclicality measure takes into account both discretionary policy action and automatic stabilizers, but excludes additional revenues that are due to applying an unchanged average tax rate to nominal GDP in excess of potential. The paper finds that fiscal policy has been procyclical on average in Latin America, but counter or acyclical in advanced economies. Country-specific results are mostly insignificant, except in a few cases where policy is clearly procyclical. For some countries (Brazil, Chile, Colombia, El Salvador, and Mexico), there is evidence of a recent move toward more countercyclical policies.

JEL Classification Numbers: E62, H30, H62.

Keywords: Fiscal policy, business cycle, Latin America.

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[1] I am grateful for helpful comments by Ana Corbacho, Kerstin Gerling, Bertrand Gruss, Daniel Leigh, Nicolas Magud, Andre Meier, Joana Pereira, Miguel Savastano, Sebastian Sosa, and Alejandro Werner.

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I. Introduction and Main Findings

A number of papers starting with Gavin and Perotti (1997) (and summarized in Table 2 below) have shown that fiscal policy has tended to be more procyclical in emerging and developing economies than in advanced ones. These studies differ substantially in their methodological approaches, starting with the definition of cyclicality of fiscal policy. One particularly striking difference concerns the treatment of automatic stabilizers, which are sometimes considered part of the fiscal response, and sometimes excluded. There is also great divergence in the treatment of special factors explaining revenues, such as commodity or asset price booms or compositional changes in GDP. Not surprisingly, the results of these studies differ, with some studies finding procyclical fiscal policy to be more widespread than others.

This paper provides a systematic overview of possible definitions of cyclical fiscal policy and then categorizes the existing studies according to them. It also contains an empirical analysis on the latest data from a broad sample of developing and advanced economies using a new definition of procyclical policy. Overall, the paper's main findings are:

- Definitions of procyclical fiscal policy vary strongly across papers, in particular with respect to the treatment of automatic stabilizers, which are sometimes counted and sometimes excluded when assessing cyclicality. This choice is often not even made explicit or justified. This paper suggests a new definition, which gives credit to automatic stabilizers that are part of the tax or benefit systems, but not to automatic revenue increases that stem from taxing additional GDP at stable tax rates. This new definition is in practice in between the more common approaches of either counting only discretionary measures or recording any revenue change.

- Typical approaches to estimating the cyclicality of fiscal policy involve regressions of a fiscal variable, such as a fiscal balance or spending, on an indicator of the economic cycle, such as the output gap or growth. As has been recognized in the recent literature, empirical estimates of cyclicality need to take account of the endogeneity of the output gap or growth, as these are affected by fiscal policy through the multiplier. This paper uses instrumental-variable approaches, including a system-GMM estimator, to overcome these issues.

- Using panel data methods, this paper finds evidence suggesting countercyclical fiscal policy in advanced economies, and generally procyclical policy in Latin America. For a broader sample of emerging markets, the evidence is less clear. These results are broadly in line with the majority of the existing literature. This paper notes, however, that results are very sensitive to specifications, making it hard to draw firm conclusions.

- A more detailed analysis of Latin American economies shows that, while many countries appear to have procyclical policy, country-specific empirical estimates

typically lack statistical significance. Much of the literature avoids the issue of statistical significance by not reporting standard errors. This paper, however, reports them consistently and finds that the evidence for the presence of procyclical policy is consistently significant only in two countries. A few countries (Brazil, Chile, Colombia, El Salvador, and Mexico) appear to have moved toward less procyclical policy since 2005.

- Commodity exports are important in many emerging economies, including in Latin America. This paper therefore controls for the impact of commodity prices on fiscal variables, which is found to be strong and significant.

While the focus of this paper is the cyclicality of policy, it should not be forgotten that this is just one aspect of fiscal policy. Other aspects, such as having to deal with a sudden financing constraint or having to reduce debt toward a sustainable level may trump cyclicality concerns. This would happen even in the absence of uncertainty about the true output gap, which poses additional policy challenges. Hence finding that a country implemented procyclical policy does not mean that it did not take the best possible course of action, given its particular circumstances.

The rest of the paper is structured as follows. Section II covers methodological issues, including the definition of cyclical fiscal policy and the treatment of commodity and asset price shocks and changes in the composition of GDP. It also provides a brief review of existing studies, categorizing them by their explicit or implicit definition of procyclical fiscal policy. Section III describes the data used, including a new commodity price index. Section IV presents our own empirical results, including panel data regressions for advanced and emerging economies and a more detailed analysis of Latin America based on country-by-country regressions. Section V briefly concludes.

II. METHODOLOGY

The basic idea of countercyclical fiscal policy may be obvious: loosen policy in recessions and tighten in booms. But as soon as one wishes to be more precise, a few difficulties arise.

A. The output gap

The first issue is the definition of booms and recessions. This is usually done by comparing actual GDP to potential output, which already leads to some difficulties. Potential GDP is a theoretical concept that is hard to measure. One approach is the use of filtering techniques to distinguish between the trend and cyclical parts of GDP. Another option is the production function approach, starting from estimates of the capital stock and the labor force. Apart from the general difficulties with estimates of the output gap, there are two specific issues that are relevant for the analysis in this paper:

- If potential GDP is estimated using a filtering technique, then estimates will change whenever new data become available, even if past data are not revised. Hence when assessing fiscal policy at some point in the past, it is necessary to distinguish carefully

between the intended and the resulting cyclical stance. As argued in various recent papers,[2] the intended fiscal stance should be estimated using data that were available when decisions were taken. To analyze the resulting actual fiscal stance, the final (or latest) data should be used.

- According to Aguiar and Gopinath (2007) emerging markets are characterized by very volatile trend growth, making it particularly hard to distinguish between trend and cycle. It is then also difficult to assess the cyclical stance of fiscal policy, as a cyclical increase in growth would call for tightening, while a structural increase would not (or less so). A more volatile policy could therefore indicate an attempt to react to new realities rather than excessive cyclicality.

Still using a traditional HP filter to estimate trend GDP has some important advantages, such as maximizing the number of available observations and ensuring systematic treatment of all countries rather than arbitrary adjustments based on varying information sets. We will therefore generally use this approach, but complement regressions that use the output gap with alternative specifications that replace it, for example, by the real growth rate. Our basic results will be calculated using the latest available data, as the main interest is the actual outturn of fiscal policy, but we also run some regressions on real-time data to compare outturns with intentions.

B. The cyclical stance

Once a decision has been made on the output gap, the next question is how to determine whether a specific fiscal policy is pro, counter or acyclical. Assume that output rises above potential. There are three effects on fiscal balances:
(i) **Higher taxable income**. Before any policy decision is taken and abstracting from automatic stabilizers,[3] revenues will increase, because of the higher taxable income. Spending would stay constant so that the fiscal balance improves.
(ii) **Automatic stabilizers**. On the revenue side, the average tax rate may rise if the tax system is progressive. On the expenditure side, social spending will fall, due to lower unemployment and poverty rates. Accordingly, the fiscal balance strengthens further.[4]

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[2] See Beetsma and Giuliodori (2010), Bernoth and others (2008), Cimadomo (2012), and Forni and Momigliano (2004) who tend to find that intended policies have been less procyclical than actual ones.

[3] Alternative definitions of automatic stabilizers are possible, which would include any increase in revenue, even at constant or falling tax rates as a stabilizer, for example if the starting assumption is an economy of lump-sum taxes. We use the more demanding definition of an automatic stabilizer which require an increase in the revenue to GDP share, as would happen under a progressive tax schedule.

[4] One could think of some very unlikely exceptions. E.g., while output rises above potential, the structure of the economy could change with lightly taxed activities replacing highly-taxed ones, leading to a fall in revenues. Likewise on the expenditure side, unemployment benefits could rise despite a boom if production shifts away from labor-intensive sectors.

(iii) **Discretionary policy**. There is a deliberate policy reaction, either tightening to counteract the cycle or loosening to make use of the additional revenues and lower spending pressures. The fiscal balance can then either improve more than implied by (i) and (ii), or less, or even deteriorate if discretionary policy is particularly loose.

This paper argues that a definition of the cyclical stance should include both automatic stabilizers and discretionary policy, but not the automatic revenue gains that would be obtained under constant tax rates due to a growing economy. The reason for adopting this definition is that ignoring the contribution of automatic stabilizers for the cyclical stance could be misleading in the analysis of policy. For example, when comparing the policy responses of two countries, noting a more active discretionary response in one of them, but not reporting on the automatic stabilizers, would not allow a comprehensive assessment. The lower amount of discretionary measures could, for example, be motivated by stronger automatic stabilizers, which reduce the need for policy action. Accordingly, broad policy advice, such as that automatic stabilizers should be allowed to run their course but no fiscal loosening should be undertaken, actually implies very different policy stances for countries, depending on the importance of their automatic stabilizers.

To develop a more concrete definition, we start by describing an acyclical policy in terms of the fiscal balance, so that any greater rise/fall in the fiscal balance in response to strong/weak economic activity would be considered countercyclical, and any lesser response or response in the opposite direction procyclical.

Initially we will ignore commodity and asset price booms. On the revenue side, an acyclical policy would be one where the average tax rate remains constant and hence where revenues remain constant as a share of GDP, i.e., revenue rises at the rate of nominal growth. Any increase beyond that during times of strong activity, be it from a progressive tax system or from policy action to increase rates, would indicate countercyclicality.

Let *R*: revenue, *G*: primary government spending, *B* (=*R*-*G*): the primary fiscal balance, and *Y*: GDP. A star denotes potential output (Y*), or the revenue, spending or balance that would prevail if output were at potential. Δ indicates the difference between the actual outcome and the hypothetical outcome if output were at potential. Then acyclical revenue would be characterized as follows:

$$R = R^* \frac{Y}{Y^*};\ \Delta R = R^* \left(\frac{Y}{Y^*} - 1\right);\ \Delta \frac{R}{Y} = 0 \qquad (1)$$

On the spending side, we focus on primary spending, given that the government has little control over the scale of its interest payments in the short term. We then assume that an acyclical policy would keep primary spending constant as a share of potential GDP. In a boom, the ratio of spending to actual GDP would therefore fall:

$$G = G^*;\ \Delta G = 0;\ \Delta \frac{G}{Y} = G^* \left(\frac{1}{Y} - \frac{1}{Y^*}\right) \qquad (2)$$

Putting this together yields:

$$B = R - G;\ \Delta B = \Delta R;\ \Delta\frac{B}{Y} = -\Delta\frac{G}{Y} \tag{3}$$

I.e., the fiscal balance as a share of GDP must improve by at least as much as the spending ratio falls, given that spending increases with potential rather than actual GDP.

Consider a simple regression relating the fiscal balance to the output gap:

$$\frac{B}{Y} = \alpha + \beta\left(\frac{Y - Y^*}{Y^*}\right) + \varepsilon \tag{4}$$

Abstracting from econometric issues such as endogeneity and omitted variable bias, we can now calculate the coefficient that would be obtained under a perfectly acyclical policy, which is the expenditure ratio:

$$\hat{\beta}_{acyclical} = \frac{\Delta\frac{B}{Y}}{\Delta\frac{Y - Y^*}{Y^*}} = \frac{G^*}{Y} \tag{5}$$

Any estimated coefficient above the expenditure ratio would indicate countercyclical policy, while a coefficient below, even if above zero, would indicate procyclical policy.

Instead, we suggest running a regression on an adjusted fiscal balance, so that a coefficient of zero becomes the expected outcome under acyclical policy:

$$\left(\frac{B}{Y}\right)' = \frac{B}{Y} + G^*\left(\frac{1}{Y} - \frac{1}{Y^*}\right) \tag{6}$$

While this definition appears intuitive, there are other possible definitions of countercyclical fiscal policy. To allow comparisons with the literature, we define three groups of definitions, which we label A to C from the strongest to the weakest. Definition A requires discretionary action for a policy to be considered countercyclical, which is tighter than our definition above. For definition B it is sufficient if automatic stabilizers work, provided they are not completely undone by counteracting discretionary measures – which is our definition above. For C, any fiscal strengthening is sufficient, even if due to temporary revenue gains at stable average tax rates. In other words, any policy in which discretionary action does not undo all of the rise in revenue (and automatic stabilizers, if present) during times of strong activity would be considered counter-cyclical.

Table 1 provides an overview of the three definitions and also provides equivalent definitions for analyses that focus only on expenditure or revenue. In practice, many papers use data on expenditure only rather than the fiscal balance to assess cyclicality. This has the advantage of largely avoiding the question of cyclical adjustments, especially if spending other than transfers is considered. Conclusions about cyclicality drawn from expenditure analysis are, however, only valid if there is no policy change on the revenue side. Otherwise, a fully tax-

financed increase in expenditure would incorrectly be interpreted as a cyclical policy response and affect estimation results.[5] Assuming that nothing happens on the revenue side, we can define equivalent expenditure-based definitions of counter-cyclical policy. Yet other papers focus on revenues only, and again, assuming that nothing happens on the spending side (or abstracting from whatever happens), the definitions can be adjusted.

Table 1: Possible definitions of countercyclical policy in a boom

	A	B	C
Idea	Discretionary fiscal policy must tighten	Tightening may be due to discretionary measures or automatic stabilizers	Tightening may be due to discretionary policy, automatic stabilizers or additional revenue at stable average tax rates.
Implications for aggregate measures	The cyclically adjusted primary balance must improve.	The primary balance must improve by more than the temporary revenue gain.	The primary balance must improve.
Implications for spending measures	Expenditure net of transfers (possibly in real terms or relative to potential GDP) must be cut.	Total (or primary) expenditures (in real terms/relative to potential GDP) must fall.	Not applicable.
Implications for revenue measures	Taxes or other levies must be increased.	Tax revenues must rise as a share of GDP	Revenues rise in real terms.

Having listed possible definitions of the cyclical stance, it is now possible to check which of these have been employed in the literature. Some papers explicitly discuss their definition as, for example, Kaminsky and others (2005), which argues for a focus on discretionary policy measures only. Other papers do not discuss this in detail, but in any case the underlying definition can be deduced from the regression specifications. Table 2 provides an overview of recent empirical studies. (A more detailed overview including the main regression specifications and estimation strategies is in Tables A1-A3 of the appendix). An interesting feature is that studies that focus on the fiscal balance either choose to require discretionary measures to label a policy as countercyclical, or accept any improvement in the fiscal balance as a sign of countercyclicality. No paper, however, appears to attempt giving credit to automatic stabilizers, without counting the revenue gain that occurs even at constant tax rates (i.e., our definition B). Papers that look at revenues or spending are split between those that require discretionary action and those that accept any revenue increase / fall in spending as a sign of countercyclical policy.

[5] A balanced-budget reform, such as a revenue-financed expenditure increase, could still have an impact on aggregate demand under certain circumstances (including a private marginal propensity to consume of less than 1). These effects should, however, be much smaller than those of a deficit-financed spending increase while an analysis focused on expenditure only would treat them the same.

The definition suggested in this paper is therefore unique in finding a middle ground between ignoring automatic stabilizers and counting all temporary revenue gains. This is achieved by using the adjusted primary balance as defined above. The cyclically-adjusted primary balance (CAPB) or structural balances (see Bornhorst and others (2011)), however, which are also sometimes used in the literature, would reveal discretionary measures only.[6] One exception would be the special case of a revenue elasticity of 1 combined with a spending elasticity of nil, as then the CAPB would be identical to the adjusted balance suggested here. Such elasticities are likely to be hold in economies with no automatic stabilizers. Clearly in such a case, the cyclical stance can only be affected by discretionary measures and counting the effect of automatic stabilizers makes no difference.

Despite the differences in definitions, most papers find signs of fiscal procyclicality, especially in developing and emerging economies, including in Latin America. Among advanced economies, there are many which employ counter or acyclical policy, although there is much diversity in policy responses. These findings are robust over many different specifications and definitions of countercyclicality, although papers with tighter definitions unsurprisingly find fewer instances of countercyclical policy. Results hold up even in most papers that take account of endogeneity issues (e.g., Ilzetzki and Vegh, 2008), which arise because the output gap is also affected by fiscal policy through the multiplier. One exception is Jaimovich and Panizza (2007), which finds no evidence of procyclical policy in developing countries using an instrumental variable approach.

[6] In practice, even discretionary measures may be lost when looking at differences in the CAPB, if such action is taken systematically and therefore included in estimated revenue elasticities.

Table 2: Definitions of counter-cyclical fiscal policy in the literature

Paper	Main specification	Finding[1]	Definition of cyclicality (explicit or implicit)		
			Fiscal balance	Expen-diture	Revenue
Alesina and others (2008)	Regression of change in fiscal balance or spending on output gap	Only advanced (OECD) economies countercyclical.	C	B	
Catao and Sutton (2002)	Regression of change in fiscal balance on output gap	Most emerging markets procyclical.	C		
Cespedes and Velasco (2011)	Regression of change in fiscal balance on output gap and cyclical component of commodity price index.	Diversity across countries; some developing economies have become more countercyclical.	C	B	B
Daude and others (2011)	Correlation between change in CAPB and output gap.	Most of Latin America procyclical.	A		
Di Bella (2009)	Regression of change in CAPB on CAPB and debt rating during 2009 downturn.	Stronger countercyclical reaction in countries with stronger fiscal positions and credit ratings.	A		
Frankel and others (2013)	Correlation between cyclical components of real government spending and real GDP.	Developing countries more procyclical than advanced, but less than in the past.		B	
Gali and Perotti (2003)	Regression of CAPB on output gap and debt.	Some European countries countercyclical, not less than before EMU.	A		
Gavin and Perotti (1997)	Regression of change in fiscal balance as a share of GDP, revenue and spending growth on real GDP growth.	Advanced economies countercyclical, especially in recessions, Latin America procyclical; revenue, however, generally acyclical.	C	A, B[2]	B
Ilzetzki and Vegh (2008)	Regression of real spending on real GDP.	Developing economies often procyclical.		B	
Jaimovich and Panizza (2007)	Regression of fiscal balance or spending on growth.	Advanced economies countercyclical, developing ones indeterminate and not statistically different from advanced.	C	B	
Kaminsky and others (2005)	Difference between spending growth in good and bad times and correlation between real spending and growth.	Most non-OECD and half of OECD countries procyclical.		A, B[2]	
Lane (2003)	Regression of government spending on GDP.	Procyclical policies more likely in countries with volatile output and dispersed political power.		A, B[2]	
Lledo and others (2011)	Regression of government spending on GDP growth.	Developing countries, especially in Sub-Saharan Africa, procyclical.		B	
Talvi and Vegh (2005)	Correlation between real output and real government consumption / revenues	Developing countries procyclical. Theoretical model links this to tax base volatility.		A	B
Vegh and Vuletin (2012)	Regression of tax rates on cyclical component of real GDP.	Tax policy acyclical in advanced, procyclical in developing economies.			A

[1] Many papers have a different focus; the finding reported here is the one on the cyclicality of policy.
[2] Depending on specification.

C. Commodity and asset price boom and compositional changes

Apart from the business cycle, tax revenues can also be strongly affected by commodity and asset prices and the composition of GDP.

The composition of GDP can play a role, as not all components are equally taxed. Exports tend to be lightly taxed while consumption is relatively heavily taxed. It is therefore conceivable that an export-driven economic boom leads to a fall in the revenue ratio, even in the absence of a tax cut. Reflecting this, Kaminsky and others (2005) note that a discretionary countercyclical policy can be accompanied by a rising, steady or falling fiscal balance as a share of GDP. On the other hand, one could argue that a falling effective average tax rate, even if due to changes in the composition of GDP, is in effect procyclical, even if not a result of discretionary policy. A government trying to maintain a countercyclical or even acyclical policy would have to take measures to undo such a fall in effective average tax rates. This would also be consistent with treating a rise in average tax rates that results from progressive tax systems as part of automatic stabilizers, as we have done above.

Asset and commodity prices may also boost revenues beyond what can be explained by real GDP growth. In the case of asset prices this occurs through wealth and transaction taxes. Commodity prices will increase profits of exporters, which can boost revenues. Even greater is the effect in countries exporting natural resources, which may be highly taxed or where the government may be a major investor itself. In economies where commodities play an important role, it is therefore important to consider the cyclical part of commodity revenues, although this can be difficult in practice. In the case of a commodity price boom, for example, it may not be clear which part of the revenue increase is structural (say, due to China's permanent rise in the world economy or due to new oil extraction technology) and which part is temporary. The simplest approach to separating cyclical and trend components would be to use filtering techniques, such as an HP filter, although this assumes away any structural breaks in the series, which is even less likely to hold for commodity prices than for GDP and therefore not employed in this paper.

In addition, even spending only the permanent revenue gains from structurally higher commodity prices is not necessarily acyclical. While there may not be an impediment from a fiscal sustainability perspective,[7] spending the additional revenues will still add to domestic demand, and would be procyclical if output is above potential. More generally, adjustment to permanent changes to commodity revenues may be counter or procyclical, depending on direction of the price change and the output gap.

From the perspective of assessing the cyclicality of fiscal policy, the relevant question is not whether commodity-related changes in revenues are permanent or temporary, but whether

[7] Although natural resource can also be seen as a national asset, the sales of which should be counted as a capital transaction, in which case only the real return on that asset should be thought of as a revenue (see e.g., Barnett and Ossowski (2003)).

their use increases or reduces economic cycles. Table 3 shows how an analysis of the overall fiscal balance can provide misleading information about fiscal policy stance when there are commodity price shocks.

Table 3: Apparent cyclicality of fiscal policy from overall fiscal balance in the presence of positive commodity price shocks

	Additional commodity revenue spent		Additional commodity revenue saved	
	Appears	But is	Appears	But is
Positive output gap	Acyclical	Pro-cyclical	Counter-cyclical	Acyclical
Negative output gap	Acyclical	Counter-cyclical	Pro-cyclical	Acyclical

Therefore, one approach would be to use a fiscal balance excluding commodity-related revenues. Unfortunately, this is available for a few countries only. A simple alternative is to analyze spending rather than balances, which will be valid unless there are simultaneous structural revenue reforms. Another approach would be to control for commodity price developments as suggested in Cespedes and Velasco (2011), by adding commodity prices as a control variable in the regression.

D. Specification

The specifications used in the previous literature are generally very similar. Apart from studies that use simple correlations, most papers use a variant of the following regression (see Appendix Table A1 for a list of specifications):

$$\Delta\left(\frac{B}{Y}\right)' = \beta_0 + \beta_1\left(\frac{Y - Y^*}{Y^*}\right) + \beta_2\left(\frac{B}{Y}\right)'_{t-1} + \gamma' x + f_i + \varepsilon \quad (7)$$

where Δ is now a standard difference indicator, x is a vector of further control variables, f_i is a country fixed effect, which is only added in case of estimation on panel data, and ε is an error term.

Some papers use the growth rate instead of the output gap, so we systematically run all regressions on both variables. As discussed, papers differ in the choice of fiscal balance used, ranging from the CAPB to the overall balance. We will generally use the primary balance adjusted as discussed above (equation (6)). Additionally, to control for commodity price booms, we will often add a variable summarizing commodity price developments.

Moreover, we will also consider an alternative specification based on the primary spending ratio instead:

$$\Delta\left(\frac{G}{Y^*}\right) = \beta_0 + \beta_1\left(\frac{Y - Y^*}{Y^*}\right) + \beta_2\left(\frac{G}{Y^*}\right)_{t-1} + \gamma' x + f_i + \varepsilon \quad (8)$$

E. Estimation

Given the ample evidence that fiscal policy affects economic growth and the output gap, estimation of equation (7) needs to reflect the endogeneity of the output gap or growth rate. In the part of the literature that addresses the endogeneity problem, the most common approach is to use instrumental-variable regressions, with common instruments being the export-weighted growth rate of trading partners and the US real interest rate, which we shall also use. An alternative approach of dealing with the endogeneity is to use a VAR, as for example in Ilzetzki and Vegh (2008), but this is more relevant for quarterly (or longer) data sets. Quarterly data are, however, difficult to obtain and interpret, given that budgets are usually annual, and given different choices by countries on the extent to which fiscal accounts are prepared on an accruals versus cash basis.

Moreover, as shown in Nickell (1981), the coefficient on the lagged dependent variable is subject to downward bias in a within-groups estimation. To address this in addition to the endogeneity of the output gap, we also report results using a system-GMM estimator proposed by Blundell and Bond (1998), when dealing with panel estimates. In the case of country-specific regressions, we will use instrumental-variable regressions, with either the lagged output gap or the export-weighted growth rate of trading partners and the US real interest rate as an instruments.

III. DATA

Our main data source is the World Economic Outlook database (Fall 2013). In addition, we use US treasury bill rates from the Federal Reserve Board, and trade and commodity price data from the UN Comtrade database. For resource-related fiscal revenues in Chile and Mexico, we use the IDB Fiscal Resources data set. Our data set covers the years 1980 to 2012, although actual data availability varies by country and variable. For the regressions based on real time data we use the WEO vintages from 1990 through 2012.

For the primary balance we use our own calculations adding back interest expenditure to overall government net lending. WEO also reports a primary balance, using the more accurate approach of also deducting interest receipts. This, however, reduces the sample size, as not all countries report such receipts. As they are typically small, we chose this approximation to have a larger sample size.[8]

For commodity prices, we use a newly-calculated price index, based on time-varying weights, lagged by *d* periods:

$$P_{i,t}^{X} = \sum_{j=1}^{J} \frac{x_{i,j,t-d}}{Y_{i,t-d}} . P_{j,t} \; ; \tag{9}$$

[8] In the case of Brazil, where interest receipts are particularly high, we use instead net interest expenditure. Indeed, in the case of Brazil, WEO reports net rather than gross interest spending.

where *i* denotes countries, *j* commodities, *t* time, $P_{j,t}$ is the logarithm of the price in US dollars, $x_{i,j,t-d}$ are export values. This index allows us to take into account that the commodity export and import basket might change substantially over a long period, while ensuring that changes in the price index reflect changes in commodity prices rather than endogenous changes in export and import volumes in response to price fluctuations.

We also considered two alternatives, one in which exports of each commodity are divided by total commodity exports, and one using commodity terms of trade to allow also for the fact that countries are simultaneously affected by commodity prices on the import side, similar to the statistic suggested by Spatafora and Tytell (2009). Results were very similar.

IV. FINDINGS

A. Panel data results

We begin with some panel data results, as these allow a quick overview of cyclicality patterns by regions. Panel regressions are also quite common in the previous literature (see appendix Tables A1 to A3). The first regressions were estimated with a simple within-group (fixed effect) model, allowing for different intercepts for each country, but imposing the same slope within a region. To avoid imposing the same slope across regions, we run separate regressions by region. Endogeneity and other econometric issues are tackled in later regressions. The coefficients provide an indication of the average cyclicality in regions, although individual countries could deviate from this. The first set of results is based on simple regression of equation (7) using three different definitions of the fiscal balance: the two traditional measures of the primary balance and the CAPB, and the adjusted primary balance as suggested above.

As shown in Table 4, the coefficient on the adjusted primary balance is always between those on the CAPB and primary balance, as expected. In advanced countries, there is evidence of countercyclical fiscal policy: the primary balance tightens at times of strong activity, and vice versa. For the CAPB, the result is insignificant, suggesting that the tightening is generally not the result of discretionary policy. For emerging and developing economies, results are mostly insignificant, so that acyclical policy cannot be rejected. One exception is the CAPB, for which a negative and significant coefficient on the output gap is found, suggesting procyclical policy. This is, however, estimated on a much smaller sample, given the availability of the CAPB. Turning to Latin America, we find evidence of procyclical policy. Interestingly, the coefficient is statistically significant also in the specification using the CAPB, suggesting that discretionary policy measures have been procyclical, at least among the 9 countries for which data are available. Overall, these results support the use of the adjusted primary balance, on which we will focus from now on.

Table 4: Within-group estimates of the cyclicality of fiscal policy for various fiscal balances.

	Advanced economies			Emerging/developing economies			Latin America		
	Δ Primary balance	Δ Adjusted primary	Δ CAPB	Δ Primary balance	Δ Adjusted primary	Δ CAPB	Δ Primary balance	Δ Adjusted	Δ CAPB
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output gap	0.434***	0.132**	0.037	0.285	-0.102	-0.240**	-0.122	-0.335**	-0.346*
	(0.068)	(0.061)	(0.132)	(0.200)	(0.116)	(0.106)	(0.139)	(0.149)	(0.183)
Lagged fiscal balance	-0.296***	-0.234***	-0.318***	-0.587***	-0.572***	-0.217	-0.490***	-0.495***	-0.040
	(0.028)	(0.025)	(0.061)	(0.083)	(0.107)	(0.128)	(0.093)	(0.082)	(0.111)
Observations	791	791	576	2,568	2,568	311	355	355	103
R-squared	0.207	0.121	0.180	0.312	0.302	0.153	0.248	0.299	0.111
Number of countries	33	33	31	146	146	29	20	20	9

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5 presents results for the various estimations, addressing the endogeneity issue as well as the effect of commodity prices, which were ignored so far. The table shows results split by advanced and developing / emerging economies, and also separately for Latin America[9] (whose economies are also included in the broad sample of emerging economies). The top part of the table presents results using the output gap as a regressor, while the lower part shows those using the growth rate.

For each region, there are three specifications:

- First a simple within-group (marked WG) as in Table 4 above.
- Second, given the importance of commodity exports for many emerging economies, including Latin American ones, there is regression controlling for commodity export prices. The price index used for this table is the one where prices are weighted by each commodity's exports as a share of GDP. For countries exporting few commodities, this index will therefore have a small total weight. The coefficient, in turn, will not automatically be smaller in countries exporting less.
- Third, to address the endogeneity of the output gap and growth, as well as the lagged adjusted primary balance, the specification is also estimated with system-GMM (marked GMM). These estimates are presented with the standard specification tests: the Arrellano-Bond AR(1) test, which is expected to be rejected, and the AR(2) test and the test of overidentifying restrictions (Sargan/Hansen test), which should both not be rejected.

[9] Given the volatile economic situation in Latin America in the 1980s we have also re-estimated the panel regressions on data starting from 1990 with very similar results. The advantage of the longer data set, however, is that in within-group regressions the bias is on weakly exogenous variables is reduced, while in GMM regressions, the specification tests were passed much more often.

The first noteworthy finding is that results are not robust to the choice of specification and estimation technique, which suggests that results based on only one specification cannot be fully convincing. Nonetheless, for advanced economies, the evidence suggests the presence of countercyclical policy, as indicated by positive and significant coefficients. In emerging and developing economies, the evidence is unclear with mostly insignificant findings. For Latin America, however, results with the output gap, including when estimated with system-GMM, are significant and indicate procyclicality. Results on the growth rate, however, are all insignificant.

Across all regions, the coefficient on the commodity price is often significant and then always positive. This is in line with expectations, as the adjusted primary fiscal balance strengthens when commodity price growth is strong, unless countries spend more than their additional resource revenues. Despite the significance of the commodity price index, its introduction does not change the other coefficients very much, suggesting that any omitted variable bias from not including it could be limited.

The specification tests of system GMM regressions are passed in all cases, except regression (3'), where the test of over-identifying restrictions rejects the validity of instruments with a p-value of 4 percent. As the result is, however, in line with all other results on advanced economies, the rejection of this specification does not affect the overall interpretation.

Table 5: The adjusted fiscal balance in various panel data estimates.

Dependent variable	Δ Adjusted primary fiscal balance								
Countries	Advanced economies			Emerging/developing economies			Latin America		
Estimation method	WG	WG	GMM	WG	WG	GMM	WG	WG	GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output gap	0.132**	0.138**	0.302***	-0.102	0.010	0.066	-0.335**	-0.343**	-0.337**
	(0.061)	(0.057)	(0.106)	(0.116)	(0.149)	(0.131)	(0.149)	(0.142)	(0.150)
Commodity price growth		0.565***	1.405**		0.547***	-0.446		0.386***	0.414
		(0.069)	(0.644)		(0.067)	(1.172)		(0.075)	(0.261)
Adjusted primary fiscal balance$_{t-1}$	-0.234***	-0.228***	0.042	-0.572***	-0.585***	-0.741***	-0.495***	-0.441***	-0.479***
	(0.025)	(0.025)	(0.103)	(0.107)	(0.134)	(0.145)	(0.082)	(0.082)	(0.125)
Observations	791	760	760	2,568	2,036	2,036	355	333	333
R-squared	0.121	0.184		0.302	0.398		0.299	0.343	
Number of countries	33	32	32	146	134	134	20	19	19
AB AR(1) test			0			0.111			0.079
AB AR(2) test			0.406			0.379			0.494
Hansen p-value			0.764			0.234			0.347
	(1)'	(2)'	(3)'	(4)'	(5)'	(6)'	(7)'	(8)'	(9)'
Growth	0.267***	0.260***	0.335***	0.034*	0.006	0.010	-0.067	-0.120	-0.170
	(0.045)	(0.046)	(0.087)	(0.020)	(0.035)	(0.038)	(0.097)	(0.122)	(0.228)
Commodity price growth		0.487***	-0.485		0.547***	0.082		0.445***	0.870
		(0.119)	(1.085)		(0.067)	(1.168)		(0.128)	(0.873)
Adjusted primary fiscal balance$_{t-1}$	-0.278***	-0.269***	-0.105	-0.577***	-0.585***	-0.719***	-0.493***	-0.424***	-0.345*
	(0.033)	(0.035)	(0.098)	(0.107)	(0.136)	(0.154)	(0.094)	(0.104)	(0.186)
Observations	791	760	760	2,568	2,036	2,036	355	333	333
R-squared	0.221	0.272		0.300	0.398		0.256	0.302	
Number of countries	33	32	32	146	134	134	20	19	19
AB AR(1) test			0.012			0.0701			0.051
AB AR(2) test			0.289			0.147			0.272
Hansen p-value			0.04			0.155			0.462

Robust errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. System GMM regressions treat the outpug gap/growth and the lagged adjusted primary fiscal balance as endogenous, using the first and second lag as instruments and the collapse option of the xtabond2 command in Stata.

Table 6 replaces the adjusted primary fiscal balance with the adjusted spending ratio, i.e., spending as a share of potential GDP.[10] This avoids many of the complications of using the fiscal balance, which reflects, even adjusted, many factors other than fiscal policy. On the other hand, these results do not allow a full assessment of cyclicality if revenue reforms take place, and may even be misleading, if changes in spending are accompanied by neutralizing revenue adjustment. The interpretation of the coefficient is now the reverse, with a positive coefficient indicating procyclicality.

[10] We also reran these regressions with real spending growth as an alternative dependent variable. Results for Latin America were very similar, but for advanced economies coefficients were insignificant, while for emerging/developing countries, most coefficients indicated procyclical policy.

In advanced economies results still indicate countercyclical policy, but are now significant only in the specifications with growth. For the emerging and developing economies, results remain mostly insignificant. In Latin America, results continue to suggest procyclical fiscal policy.

Table 6: Adjusted primary spending ratio in panel data estimates.

Dependent variable	Δ Adjusted primary spending ratio								
Countries	Advanced economies			Emerging/developing economies			Latin America		
Estimation method	WG	WG	GMM	WG	WG	GMM	WG	WG	GMM
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Output gap	-0.028	-0.020	-0.098	0.233**	0.131	0.122	0.247***	0.244***	0.287***
	(0.049)	(0.054)	(0.119)	(0.092)	(0.138)	(0.169)	(0.059)	(0.063)	(0.093)
Commodity price growth		-0.403***	-1.700***		-0.247***	-1.679		0.141	0.602**
		(0.023)	(0.408)		(0.033)	(1.197)		(0.098)	(0.286)
Adjusted prim. spending$_{t-1}$	-0.161***	-0.155***	-0.013	-0.298***	-0.333***	-0.933***	-0.258**	-0.208**	-0.160
	(0.029)	(0.030)	(0.131)	(0.029)	(0.033)	(0.271)	(0.095)	(0.077)	(0.164)
Observations	791	760	760	2,594	2,037	2,037	356	334	334
R-squared	0.083	0.122		0.184	0.237		0.146	0.133	
Number of countries	33	32	32	146	134	134	20	19	19
AB AR(1) test			0.004			0.126			0.021
AB AR(2) test			0.246			0.370			0.662
Hansen p-value			0.045			0.192			0.258
	(1)'	(2)'	(3)'	(4)'	(5)'	(6)'	(7)'	(8)'	(9)'
Growth	-0.223***	-0.220***	-0.409***	0.053	0.082	0.117	0.179***	0.169**	0.108
	(0.044)	(0.046)	(0.124)	(0.066)	(0.090)	(0.130)	(0.058)	(0.060)	(0.080)
Commodity price growth		-0.323***	2.245		-0.253***	-3.058*		0.062	0.416
		(0.057)	(1.737)		(0.029)	(1.825)		(0.090)	(0.363)
Adjusted prim. spending$_{t-1}$	-0.211***	-0.204***	-0.177	-0.285***	-0.333***	-0.998**	-0.248**	-0.195**	-0.087
	(0.036)	(0.039)	(0.158)	(0.028)	(0.032)	(0.416)	(0.088)	(0.068)	(0.166)
Observations	791	760	760	2,594	2,037	2,037	356	334	334
R-squared	0.179	0.210		0.161	0.240		0.162	0.144	
Number of countries	33	32	32	146	134	134	20	19	19
AB AR(1) test			0.130			0.098			0.024
AB AR(2) test			0.375			0.227			0.679
Hansen p-value			0.935			0.858			0.359

Robust errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. System GMM regressions treat the outpug gap/growth and lagged primary spending as endogenous, using the first and second lag as instruments and the collapse option of the xtabond2 command in Stata.

Overall, the conclusion from the panel data is that the evidence broadly confirms the previous findings of countercyclical fiscal policy in advanced economies and procyclical policy in Latin America. For the broader sample of emerging and developing countries, results were inconclusive.

In addition to the regressions shown, we ran further specifications with alternative commodity price indicators (commodity prices weighted by total commodity exports instead of GDP, and commodity prices applied to net rather than gross commodity exports). These results were all broadly similar.

B. Country-specific results

Fiscal policy is likely to be run differently across countries, even within a region. Therefore panel estimates, though common in the literature, can only give a first impression as they force the same cyclicality coefficient on all countries.

Table 7 presents results from country-by-country regressions of the adjusted fiscal balance. Regressions were run on data from 1990-2012. As before, these regressions include the lagged adjusted fiscal balance and the commodity price index, but to maintain readability only the coefficient on the output gap is reported. In addition to OLS results, the table also reports two instrumental-variable specifications, as the system-GMM approach cannot be used in pure time-series regressions. In the first of these instrumental-variable regressions the lagged output gap is used as an instrument. In the second approach the export-weighted GDP growth of trading partners and the US 1-year treasury rate serve as instruments, as done in other papers in the literature (see Appendix Tables A1-A3). Finally, the table reports on regressions allowing a varying degree of cyclicality over time, showing coefficients for the period before 2005 and the change to the coefficient afterwards. In these regressions the output gap and the commodity price index were interacted with the time indicator. The year 2005 was chosen, as panel regressions (see Appendix Table A4) suggest this to be the year with the most significant change in coefficient, while for comparability a single year for all countries seemed useful.

What stands out from a first glance at Table 7 is the very small number of statistically significant results.[11] The literature often avoids this issue by not reporting standard errors (Lane, 2003) or by showing coefficients of correlation only (various papers, see Tables A1-A3). This may also explain the large number of studies focusing on panel data estimates, even though the cyclicality of policy is more interesting at the country level (particularly in regions where countries determine their own fiscal policy).

There are, however, some interesting and relatively strong results: Two countries come out as having a procyclical fiscal policy. Ecuador and Venezuela also show procyclical fiscal policy in the OLS regression, but as it does not hold up in any of the instrumental-variable estimates, no clear conclusion can be drawn. None of the country-specific results provide a strong indication of a countercyclical policy. While Guyana has a positive and significant

[11] A similar country-by-country analysis of the adjusted spending ratio (Appendix Table A5) shows even fewer statistically significant results. Analysis of adjusted fiscal balance net of resource revenues (Appendix Table A6), however, shows all countries employing procyclical fiscal policy based on this measure. This is, however, a very tight benchmark for countercyclical policy, as it would require countries in a boom that is accompanied by strong commodity prices to save the entire increase in such revenues (permanent or not) and moreover, increase other revenues or cut spending. This would be politically very difficult. Instead, it seems that countries let booming commodity revenues replace other revenues.

coefficient in the OLS regression, it does not hold up in any of the instrumental variable estimations. The instruments, in particular the export-weighted growth of trading partners and the US treasury bill rate, are often not very strong, in that many first stage regressions have extremely low R^2 ratios. As a result, the coefficients sometimes turn out at implausible levels (e.g., IV-1 in Brazil). Given the broader issue of 'weak-instruments' regressions, it would be unwise to draw any conclusions from such findings.

The time-varying regressions offer some further insights. Fiscal policy in Brazil,[12] Chile, Colombia, El Salvador, and Mexico appears to have become more countercyclical since 2005. Only Honduras appears to have become more procyclical.

The results so far have all been obtained by using the latest estimates of the output gap. However, as noted above, these estimates change, even for past years, when updates are made. So they allow at best an ex-post assessment of the impact of fiscal policy. The intention of fiscal policy, based on output gap forecasts available at the time could be different. To check for this, we reran these regressions on a historical output gap series that uses the estimated output gap for a given year based on data available at the Fall WEO of the previous year (Table 8). This confirms the findings of procyclicality in two countries, except that the result in Argentina is insignificant when using instrumental variable estimation.[13] In Costa Rica, we now find evidence of countercyclical policy. This suggests that budgets in Costa Rica were aiming to be countercyclical based on available data at the time. In two countries, however, fiscal policy was procyclical even using historical data, suggesting that fiscal policy could have been noticed to be procyclical even at the time of implementation.[14]

[12] In the case of Brazil, policy lending, which is not part of the fiscal balance, but may affect the fiscal stance, has grown in importance. If net policy lending is added to the adjusted fiscal balance, the coefficient on the output gap interacted with the post-2005 dummy becomes larger, but as the standard error rises even more, turns insignificant.

[13] Whether an instrumental variable approach is needed in this case is debatable, as the output gap is a forecast that will only be endogenous to fiscal policy to the extent that such an impact is modeled, and fiscal policy does not deviate from the projected level.

[14] It is still possible that the intention of budgets was to be countercyclical and that assessment was made on a national definition of the output gap or that budget amendments or overruns ultimately led to procyclical policy.

Table 7: Coefficients on the output gap from country-by-country regressions

	Δ Adjusted primary balance				
	OLS	IV-1	IV-2	OLS	
				pre-2005	Δ since 2005
Argentina	-0.316***	-0.381**	-0.238	-0.255**	-0.362
	(0.078)	(0.149)	(0.187)	(0.113)	(0.674)
Belize	0.217	2.397	0.201	0.540	-0.529
	(0.303)	(1.756)	(1.303)	(0.354)	(0.480)
Bolivia	-0.449	-0.208	-0.141	-0.415	0.008
	(0.376)	(1.003)	(1.016)	(0.429)	(1.118)
Brazil	0.322	5.551	0.010	-0.164	0.736*
	(0.193)	(21.960)	(1.656)	(0.207)	(0.329)
Chile	0.269	-1.095	1.374*	0.002	0.904**
	(0.255)	(1.209)	(0.690)	(0.166)	(0.338)
Colombia	-0.137	-0.499	0.145	-0.311	0.685*
	(0.163)	(0.453)	(0.335)	(0.245)	(0.384)
Costa Rica	0.245	-0.772	0.969*	-0.346	0.750
	(0.197)	(1.452)	(0.440)	(0.328)	(0.511)
Ecuador	-0.481**	0.600	0.974	-0.281	0.126
	(0.215)	(2.448)	(1.179)	(0.227)	(0.502)
El Salvador	0.304	-1.026	0.687***	-0.076	0.612*
	(0.185)	(2.897)	(0.220)	(0.235)	(0.324)
Guatemala	0.140	-0.752	0.585	-0.418	0.616
	(0.162)	(1.693)	(0.431)	(1.235)	(1.276)
Guyana	1.119***	-0.889	2.234	1.119	0.071
	(0.227)	(6.462)	(4.859)	(0.829)	(0.834)
Honduras	0.209	0.183	0.541	1.510*	-1.422*
	(0.142)	(0.371)	(0.574)	(0.654)	(0.685)
Mexico	-0.210	0.429	0.532	-0.324**	0.458**
	(0.138)	(0.658)	(1.075)	(0.150)	(0.192)
Nicaragua	-0.331	-0.708	-0.238	-0.808**	0.842
	(0.213)	(0.613)	(0.319)	(0.291)	(0.451)
Paraguay	-0.071	4.981	0.098	-0.131	0.187
	(0.129)	(35.752)	(0.244)	(0.253)	(0.287)
Peru	0.364	0.577*	1.325	0.204	0.152
	(0.295)	(0.278)	(0.989)	(0.575)	(0.534)
Suriname	-1.096	-9.853	-2.807	-1.263	0.794
	(0.680)	(10.884)	(1.782)	(0.771)	(2.158)
Uruguay	-0.449***	-0.706***	-0.267	-0.460***	0.135
	(0.069)	(0.176)	(0.230)	(0.079)	(0.218)
Venezuela	-0.601***	0.277	0.362	-0.539***	0.257
	(0.155)	(0.825)	(0.766)	(0.154)	(0.373)

Robust standard errors in parentheses. IV-1 uses the lagged output gap as an instrument, IV-2 the US 1-year treasury bill and the export-weighted growth rate of trading partners. The coefficient on the output gap is shown. All regressions also include a constant, a lagged dependent variable, and the commodity price index.

Table 8: Ex ante cyclicality: coefficients on the historical output gap from country-by-country regressions

	Δ Adjusted primary balance		
	OLS	IV-1	IV-2
Argentina	-0.381***	-0.529	-1.113
	(0.120)	(0.481)	(0.785)
Belize	-0.903	-4.754	0.066
	(0.775)	(11.712)	(1.957)
Bolivia	2.057	2.500	3.089
	(1.535)	(4.120)	(2.247)
Brazil	1.002**	-5.287	0.763
	(0.394)	(60.338)	(0.942)
Chile	0.631	6.754	-1.794
	(0.378)	(15.275)	(3.514)
Colombia	0.348	-1.141	0.601
	(0.482)	(1.033)	(1.387)
Costa Rica	1.512***	1.519	1.992***
	(0.329)	(1.962)	(0.413)
Ecuador	-0.674	-0.679	-0.342
	(0.387)	(1.145)	(1.114)
El Salvador	0.447*	1.046	-0.751
	(0.215)	(0.679)	(1.227)
Guatemala	0.112	-1.132	0.303
	(0.483)	(4.687)	(0.388)
Guyana	-0.513	2.243	0.501
	(0.917)	(3.800)	(1.140)
Honduras	0.900	1.498	1.115
	(0.567)	(0.847)	(0.962)
Mexico	0.027	0.145	1.153
	(0.169)	(0.460)	(1.582)
Nicaragua	-0.277	-2.209	-1.576
	(0.640)	(19.061)	(1.863)
Paraguay	0.082	-3.038	-2.107
	(0.369)	(4.025)	(2.149)
Peru	-0.419	-3.857	0.556
	(0.731)	(3.778)	(2.818)
Suriname	-1.023	-0.576	-2.658
	(1.296)	(3.909)	(2.003)
Uruguay	-0.262***	-0.469*	-0.365
	(0.048)	(0.209)	(0.312)
Venezuela	-0.894*	-1.024	-0.615
	(0.511)	(1.056)	(2.058)

Robust standard errors in parentheses. IV-1 uses the lagged output gap as an instrument, IV-2 the US 1-year treasury bill and the export-weighted growth rate of trading partners. The coefficient on the output gap is shown. All regressions also include a constant, a lagged dependent variable, and the commodity price index.

V. CONCLUSION

This paper has considered the cyclicality of fiscal policy in Latin America. Using a new methodology that gives full credit to automatic stabilizers, controlling for commodity prices, and allowing for endogeneity, the paper confirms that fiscal policy has been procyclical on average in Latin America, compared to counter or acyclical policy in advanced economies. Looking at country-specific estimations, results are mostly insignificant—a common, but often unacknowledged—feature of the literature. This means that acyclical fiscal policy cannot be ruled out for most countries. For two countries, however, the evidence for procyclicality is significant even at the country level. Evidence from real time data suggests that in Costa Rica, policy had been intended to be countercyclical, even though the result on final data was insignificant. Looking at possible changes in more recent years, the paper finds that Brazil, Chile, Colombia, El Salvador, and Mexico have moved toward more countercyclical policy.

VI. APPENDIX

Table A1: Overview of specifications in papers estimating the cyclicality of the fiscal balance

Paper	Main specification	Instruments	Main estimates	Estimated coefficient
Alesina and others (2008)	$\Delta\frac{B}{Y} = \beta_1(\ln Y - \ln Y^*) + \beta_2\frac{B}{Y_{t-1}} + \beta_3 TOTgap + f_i + \varepsilon$	Output gap in the rest of the region	Panel	OECD: $\hat{\beta}_1 = 0.549$ *** Non-OECD: $\hat{\beta}_1 = -0.018$
Catao and Sutton (2002)	$\Delta\frac{B}{Y} = \beta_0 + \beta_1\left(\frac{Y-Y^*}{Y^*}\right) + \beta_2\frac{B}{Y_{t-1}} + \beta_3 TOTgap + \varepsilon$	Only in robustness checks (not reported in paper)	By country	Overall emerg. markets: $\hat{\beta}_1 = -.08$ Lat. America: $\hat{\beta}_1 = -.14$ Asia: $\hat{\beta}_1 = -.03$ Other: $\hat{\beta}_1 = -.03$
Cespedes and Velasco (2011)	$\Delta\frac{B}{Y} = \beta_0 + \beta_1\left(\frac{Y-Y^*}{Y^*}\right) + \beta_2\frac{B}{Y_{t-1}} + \beta_3 C + \varepsilon$	-	By country	Before 2000: $\hat{\beta}_1 = 0.02$ After 2000: $\hat{\beta}_1 = 0.18$
Daude and others (2011)	$\rho_{CAPB,\left(\frac{Y-Y^*}{Y^*}\right)}$	-	Pooled	$\hat{\rho} = -0.37$
Gali and Perotti (2003)	$\Delta\frac{CAPB}{Y} = \beta_0 + \beta_1\left(\frac{Y-Y^*}{Y^*}\right) + \beta_2\frac{CAPB}{Y}_{t-1} + \beta_3\frac{D}{Y} + f_i + \varepsilon$	Lagged own output gap and lagged US GDP (EU15 GDP for US)	Panel/by country	EMU pre 1992: $\hat{\beta}_1 = -0.17$ *** EMU post 1992 $\hat{\beta}_1 = 0.08$ OECD5 pre '92 $\hat{\beta}_1 = 0.14$ OECD5 post'92 $\hat{\beta}_1 = 0.72$ ***
Gavin and Perotti (1997)	$\Delta\frac{B}{Y} = \beta_1\hat{Y} + \beta_2\frac{B}{Y_{t-1}} + \beta_3\widehat{TOT} + f_i + \varepsilon$	-	Panel	Industrial: $\hat{\beta}_1 = 0.368$ *** Latin America: $\hat{\beta}_1 = 0.042$
Jaimovich and Panizza (2007)	$\Delta\frac{B}{Y} = \beta_1\hat{Y} + \beta_2\frac{B}{Y_{t-1}} + \beta_3\widehat{TOT} + f_i + \varepsilon$	Export-weighted growth in trading partners	Panel	Industrial: $\hat{\beta}_1 = 0.585$ *** Developing: $\hat{\beta}_1 = 0.453$ ***

Notes: Notation adjusted to the one used in this paper. Variables not defined elsewhere: TOT: terms of trade, TOTgap: terms of trade gap, C: cyclical component of commodity price index.

Table A2: Overview of specifications in papers estimating the cyclicality of spending

Paper	Main specification	Instruments	Main estimates	Estimated coefficient
Alesina and others (2008)	$\Delta\frac{G}{Y} = \beta_1(\ln Y - \ln Y^*) + \beta_2\frac{G}{Y_{t-1}} + \beta_3 TOTgap + f_i + \varepsilon$	Output gap in the rest of the region	Panel	OECD: $\hat{\beta}_1 = -10.1\ **$ Non-OECD: $\hat{\beta}_1 = -3.68$
Cespedes and Velasco (2011)	$\Delta\frac{G}{Y} = \beta_0 + \beta_1\left(\frac{Y - Y^*}{Y^*}\right) + \beta_2\frac{G}{Y_{t-1}} + \beta_3 C + \varepsilon$	-	By country	Before 2000: $\hat{\beta}_1 = 0.06$ After 2000: $\hat{\beta}_1 = -0.15$
Frankel and others (2013)	$\rho_{G,Y}$	-	By country	Country specific, no average reported.
Gavin and Perotti (1997)	$\hat{G} = \beta_1\hat{y} + \beta_2\frac{B}{Y_{t-1}} + \beta_3\widehat{TOT} + f_i + \varepsilon$	-	Panel	Industrial: $\hat{\beta}_1 = 0.09$ Latin America: $\hat{\beta}_1 = 1.09$
Ilzetski and Vegh (2008)	$\Delta lnG = \beta_1\Delta Y + \varepsilon$ (The fact that G, but not Y, is in logs may be a typo in the paper)	Export-weighted growth in trading partners and real US short-term treasury rate.	Panel	Developing: $\hat{\beta}_1 = 0.61\ **$ High income: $\hat{\beta}_1 = -0.11$
Jaimovich and Panizza (2007)	$\hat{G} = \beta_1\hat{Y} + \beta_2\frac{B}{Y_{t-1}} + \beta_3\widehat{TOT} + f_i + \varepsilon$	Export-weighted growth in trading partners	Panel	Industrial: $\hat{\beta}_1 = 0.840\ **$ Developing: $\hat{\beta}_1 = 0.009$
Kaminsky and others (2005)	$\overline{\hat{G}}_{\hat{y}>\hat{y}_{median}} - \overline{\hat{G}}_{\hat{y}<\hat{y}_{median}}$ and $\rho_{G,Y}$	-	By country	OECD: $\Delta = 0.4,\ \hat{\rho} = -0.06$ Middle-high-inc: $\Delta = 7.0,\ \hat{\rho} = -0.43\ *$ Middle-low-inc: $\Delta = 3.9,\ \hat{\rho} = -0.20\ *$ Low-inc: $\Delta = 7.8,\ \hat{\rho} = -0.37\ *$
Lane (2003)	$\Delta lnG = \beta_0 + \beta_1\Delta lnY + \varepsilon$	As robustness check: trading-partners' growth and lagged own growth.	By country	$\beta_1 = 0.01$
Lledo and others (2011)	$\hat{G} = \beta_1\hat{y} + \beta_2\widehat{TOT} + f_i + \varepsilon$	Difference / system GMM	Panel	Sub-Saharan Africa:1.76**** Other developing: 1.09** Advanced: -0.36
Talvi and Vegh (2005)	$\rho_{G,Y}$	-	By country	All Industrial: $\hat{\rho} = 0.17\ **$ G7: $\hat{\rho} = -0.02$ Developing: $\hat{\rho} = 0.53\ ***$

Notes: Notation adjusted to the one used in this paper. Where coefficients for various expenditure categories are given, the most general one is reported (i.e., the one closest to general government total spending).

Table A3: Overview of specifications in papers estimating the cyclicality of revenues

Paper	Main specification	Instruments	Main estimates	Estimated coefficient
Cespedes and Velasco (2011)	$\Delta\frac{R}{Y} = \beta_0 + \beta_1\left(\frac{Y-Y^*}{Y^*}\right) + \beta_2\frac{R}{Y_{t-1}} + \beta_3 C + \varepsilon$	-	By country	Before 2000: $\hat{\beta}_1 = 0.02$ After 2000: $\hat{\beta}_1 = -0.01$
Gavin and Perotti (1997)	$\hat{R} = \beta_1\hat{y} + \beta_2\frac{B}{Y_{t-1}} + \beta_3\widehat{TOT} + f_i + \varepsilon$	-	Panel	Industrial: $\hat{\beta}_1 = 0.93$ Latin America: $\hat{\beta}_1 = 1.36$
Talvi and Vegh (2005)	$\rho_{R,Y}$	-	By country	All Industrial: $\hat{\rho} = 0.38$ *** G7: $\hat{\rho} = 0.31$** Developing: $\hat{\rho} = 0.53$ ***
Vegh and Vuletin (2012)	$Tax\ rate\ index = \beta_0 + \beta_1 Y + f_i + \varepsilon$	Trading-partners' growth, change in export prices, and change in real US treasury yields.	Panel	Industrial: $\hat{\beta}_1 = 0.02$ Developing: $\hat{\beta}_1 = -1.39$ **

Table A4: Within group regressions of the adjusted fiscal balance in Latin America, with time interactions

t	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Output gap	-0.715***	-0.653***	-0.699***	-0.583***	-0.560***	-0.559***	-0.535***	-0.508***	-0.454***	-0.432**	-0.352**
	(0.212)	(0.178)	(0.182)	(0.183)	(0.132)	(0.131)	(0.135)	(0.147)	(0.155)	(0.151)	(0.164)
Output gap*year ≥ t	0.569***	0.505***	0.614***	0.515***	0.671***	0.715***	0.691***	0.656***	0.553***	0.506***	0.238
	(0.164)	(0.121)	(0.138)	(0.115)	(0.117)	(0.123)	(0.127)	(0.138)	(0.150)	(0.172)	(0.286)
Adjusted deficit$_{t-1}$	-0.502***	-0.504***	-0.501***	-0.499***	-0.515***	-0.517***	-0.511***	-0.502***	-0.503***	-0.506***	-0.509***
	(0.095)	(0.095)	(0.097)	(0.099)	(0.095)	(0.091)	(0.088)	(0.085)	(0.081)	(0.080)	(0.081)
Observations	355	355	355	355	355	355	355	355	355	355	355
R-squared	0.330	0.324	0.338	0.330	0.344	0.346	0.341	0.340	0.336	0.339	0.307
Number of countries	20	20	20	20	20	20	20	20	20	20	20
	(1)'	(2)'	(3)'	(4)'	(5)'	(6)'	(7)'	(8)'	(9)'	(10)'	(11)'
Output gap	-0.592***	-0.559***	-0.626***	-0.527***	-0.508***	-0.503***	-0.482***	-0.471***	-0.427***	-0.430***	-0.367**
	(0.168)	(0.136)	(0.144)	(0.140)	(0.098)	(0.099)	(0.104)	(0.124)	(0.132)	(0.143)	(0.154)
Output gap*year ≥ t	0.394*	0.360**	0.486***	0.411***	0.571***	0.610***	0.587***	0.568***	0.460***	0.483**	0.232
	(0.188)	(0.141)	(0.162)	(0.124)	(0.129)	(0.128)	(0.118)	(0.130)	(0.144)	(0.194)	(0.253)
Commodity price	0.668**	0.596**	0.521*	0.540	0.539	0.527**	0.505**	0.488***	0.457**	0.417***	0.479***
growth	(0.288)	(0.269)	(0.299)	(0.316)	(0.323)	(0.245)	(0.209)	(0.149)	(0.160)	(0.125)	(0.104)
Commodity price	-0.371	-0.313	-0.234	-0.264	-0.277	-0.281	-0.268	-0.263	-0.188	-0.123	-0.432*
growth*year ≥ t	(0.289)	(0.276)	(0.316)	(0.328)	(0.339)	(0.272)	(0.262)	(0.184)	(0.210)	(0.172)	(0.214)
Adjusted deficit$_{t-1}$	-0.429***	-0.434***	-0.430***	-0.432***	-0.445***	-0.452***	-0.454***	-0.451***	-0.453***	-0.454***	-0.467***
	(0.089)	(0.092)	(0.093)	(0.100)	(0.096)	(0.088)	(0.083)	(0.081)	(0.080)	(0.079)	(0.081)
Observations	333	333	333	333	333	333	333	333	333	333	333
R-squared	0.373	0.367	0.377	0.370	0.384	0.388	0.384	0.385	0.380	0.383	0.366
Number of countries	19	19	19	19	19	19	19	19	19	19	19

Robust standard errors in parentheses.

Table A5: Coefficients on the output gap from country-by-country regressions of the adjusted spending ratio

	Δ Adjusted primary spending				
	OLS	IV-1	IV-2	OLS	
				pre-2005	Δ since 2005
Argentina	0.280	-0.274	-0.020	0.297	0.033
	(0.202)	(0.208)	(0.260)	(0.249)	(0.561)
Belize	-0.124	-1.033	2.263	-0.456	0.535
	(0.241)	(1.009)	(3.839)	(0.270)	(0.410)
Bolivia	0.788**	0.126	-2.091	0.518*	1.451
	(0.323)	(1.110)	(2.394)	(0.262)	(1.870)
Brazil	0.577*	1.044	-0.255	0.692**	-0.242
	(0.279)	(2.479)	(1.428)	(0.216)	(0.263)
Chile	0.167*	0.506	0.043	0.218**	-0.206
	(0.088)	(0.296)	(0.194)	(0.100)	(0.240)
Colombia	0.137	0.177	-0.074	0.269	-0.482*
	(0.161)	(0.533)	(0.317)	(0.206)	(0.270)
Costa Rica	0.074	0.719	-0.256	0.169	-0.138
	(0.117)	(0.804)	(0.215)	(0.317)	(0.485)
Ecuador	0.532	-1.072	-1.760	-0.213	0.503
	(0.492)	(6.012)	(2.390)	(0.616)	(1.052)
El Salvador	-0.185	1.205	-0.859	0.031	-0.288
	(0.210)	(2.244)	(0.617)	(0.291)	(0.382)
Guatemala	0.176	-0.119	-0.047	-0.480	0.796
	(0.120)	(0.358)	(0.288)	(0.672)	(0.805)
Guyana	-1.086**	5.882	1.119	0.006	-1.530**
	(0.438)	(18.238)	(7.015)	(0.524)	(0.495)
Honduras	0.353	0.948*	0.074	-0.183	0.624
	(0.279)	(0.486)	(0.448)	(0.727)	(0.811)
Mexico	0.196	-0.129	-0.109	0.183	-0.022
	(0.115)	(0.578)	(0.219)	(0.157)	(0.217)
Nicaragua	0.268	-1.008	0.032	-0.139	0.501
	(0.209)	(4.107)	(0.268)	(0.272)	(0.323)
Paraguay	-0.011	-7.213	-0.062	0.521*	-0.984***
	(0.217)	(49.365)	(0.228)	(0.246)	(0.268)
Peru	0.180	-0.743	-0.161	0.653**	-0.586**
	(0.166)	(1.215)	(0.386)	(0.224)	(0.236)
Suriname	0.882*	6.345	0.686	1.072**	-2.675
	(0.451)	(8.867)	(1.731)	(0.477)	(1.911)
Uruguay	0.475**	0.528**	-0.200	0.491**	-0.981**
	(0.177)	(0.205)	(0.363)	(0.156)	(0.286)
Venezuela	0.336**	-1.052	0.102	0.187	0.394
	(0.132)	(1.780)	(0.422)	(0.178)	(0.550)

Robust standard errors in parentheses. IV-1 uses the lagged output gap as an instrument, IV-2 the US 1-year treasury bill and the export-weighted growth rate of trading partners. The coefficient on the output gap is shown. All regressions also include a constant, a lagged dependent variable, and the commodity price index.

Table A6: Country-by-country regressions using adjusted balance net of resource revenues

	Δ Adjusted non-commodity primary balance				
	OLS	IV-1	IV-2	OLS	
				pre-2005	Δ since 2005
Argentina	-0.360***	-0.296***	-0.340***	-0.354***	-0.030
	(0.020)	(0.049)	(0.018)	(0.027)	(0.044)
Bolivia	-0.337***	-0.299***	-0.263***	-0.317***	-0.027
	(0.014)	(0.041)	(0.055)	(0.018)	(0.022)
Chile	-0.208***	-0.188***	-0.198***	-0.212***	0.009
	(0.005)	(0.014)	(0.015)	(0.003)	(0.013)
Colombia	-0.274***	-0.294***	-0.277***	-0.271***	-0.007*
	(0.003)	(0.050)	(0.003)	(0.003)	(0.004)
Costa Rica	-0.158***	-0.139***	-0.154***	-0.172***	0.017*
	(0.005)	(0.030)	(0.005)	(0.007)	(0.008)
Ecuador	-0.290***	-0.177	-0.239***	-0.210***	-0.105**
	(0.034)	(0.172)	(0.065)	(0.028)	(0.039)
Guyana	-0.335***	-0.264***	-0.347***	-0.292***	-0.053**
	(0.010)	(0.077)	(0.056)	(0.022)	(0.023)
Mexico	-0.227***	-0.244**	-0.232***	-0.213***	-0.040***
	(0.009)	(0.090)	(0.020)	(0.006)	(0.008)
Peru	-0.188***	-0.187***	-0.185***	-0.190***	0.003
	(0.001)	(0.005)	(0.009)	(0.004)	(0.004)
Suriname	-0.259***	-0.220**	-0.291***	-0.268***	0.044**
	(0.008)	(0.091)	(0.052)	(0.007)	(0.015)
Venezuela	-0.328***	-0.323***	-0.329***	-0.321***	-0.029*
	(0.005)	(0.041)	(0.012)	(0.004)	(0.013)

Robust standard errors in parentheses. IV-1 uses the lagged output gap as an instrument, IV-2 the US 1-year treasury bill and the export-weighted growth rate of trading partners. Resource revenue data for Chile and Mexico stem from the IDB Fiscal Resources database. The coefficient on the output gap is shown. All regressions also include a constant and a lagged dependent variable.

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